

LONG LOOPS

LOOP INDUCTANCE DESIGN TABLE

LOOP INDUCTANCE (MICROHENRIES)

WIDTH OF LOOP

6 FEET

8 FEET

1 TURN

2 TURNS

3 TURNS

1 TURN

2 TURNS

3 TURNS

10

-

98

206

-

104

218

15

-

138

291

-

144

303

20

-

178

376

-

184

388

25

-

218

461

-

224

473

30

-

258

546

-

264

558

35

-

298

-

-

304

-

40

106

338

-

108

344

-

45

118

378

-

120

384

-

50

131

418

-

133

424

-

55

143

458

-

145

464

-

60

156

498

-

158

504

-

65

168

538

-

170

544

-

70

181

578

-

183

584

-

NOTE:

1. THE ABOVE INDUCTANCES ARE ESTIMATED VALUES USING THE FOLLOWING EQUATIONS.

1 TURN = (PERIMETER X 0.5) + (LOOP LENGTH X 1.5)

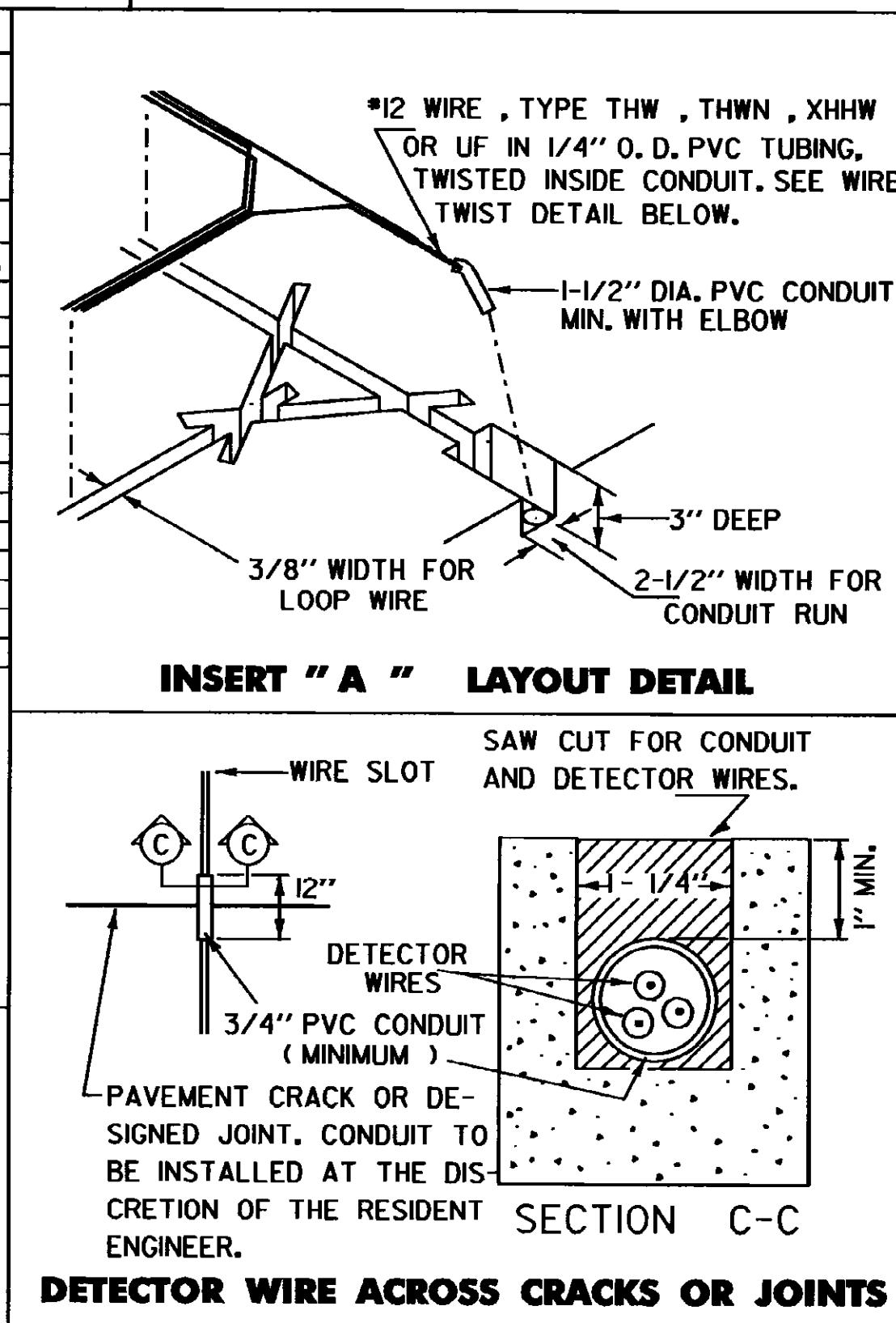
2 TURN = (PERIMETER X 1.5) + (LOOP LENGTH X 5.0)

3 TURN = (PERIMETER X 3.0) + (LOOP LENGTH X 11.0)

2. SEE NOTES # 1 & 3 UNDER THE RECTANGULAR LOOP TABLE.

MINIMUM 5 TWISTS PER FOOT.
BOTH WIRES SHALL BE TWISTED

WIRE TWIST DETAIL



RECTANGULAR LOOPS

LOOP INDUCTANCE DESIGN TABLE

WIDTH OF LOOP					LOOP PERIMETER (FT.)	LOOP INDUCTANCE (MICROHENRIES)			
LENGTH OF LOOP (FEET)	4 FEET	6 FEET	8 FEET	10 FEET		2 TURNS K=42	3 TURNS K=38	4 TURNS K=36	5 TURNS K=33
	8	6	-	-	24	40	82	138	198
	10	8	-	-	28	47	96	161	231
	12	10	8	-	32	54	109	184	264
	14	12	10	-	36	60	123	207	297
	16	14	12	10	40	67	137	230	330
	18	16	14	12	44	74	151	254	367
	20	18	16	14	48	81	164	277	396
	22	20	18	16	52	87	178	300	429
	24	22	20	18	56	94	192	323	462
	26	24	22	20	60	101	205	346	495
	28	26	24	22	64	108	219	369	-
	30	28	26	24	68	114	232	392	-
	32	30	28	26	72	121	246	415	-
	34	32	30	28	76	128	260	438	-
	37	35	33	31	82	138	280	472	-
	42	40	38	36	92	155	315	530	-

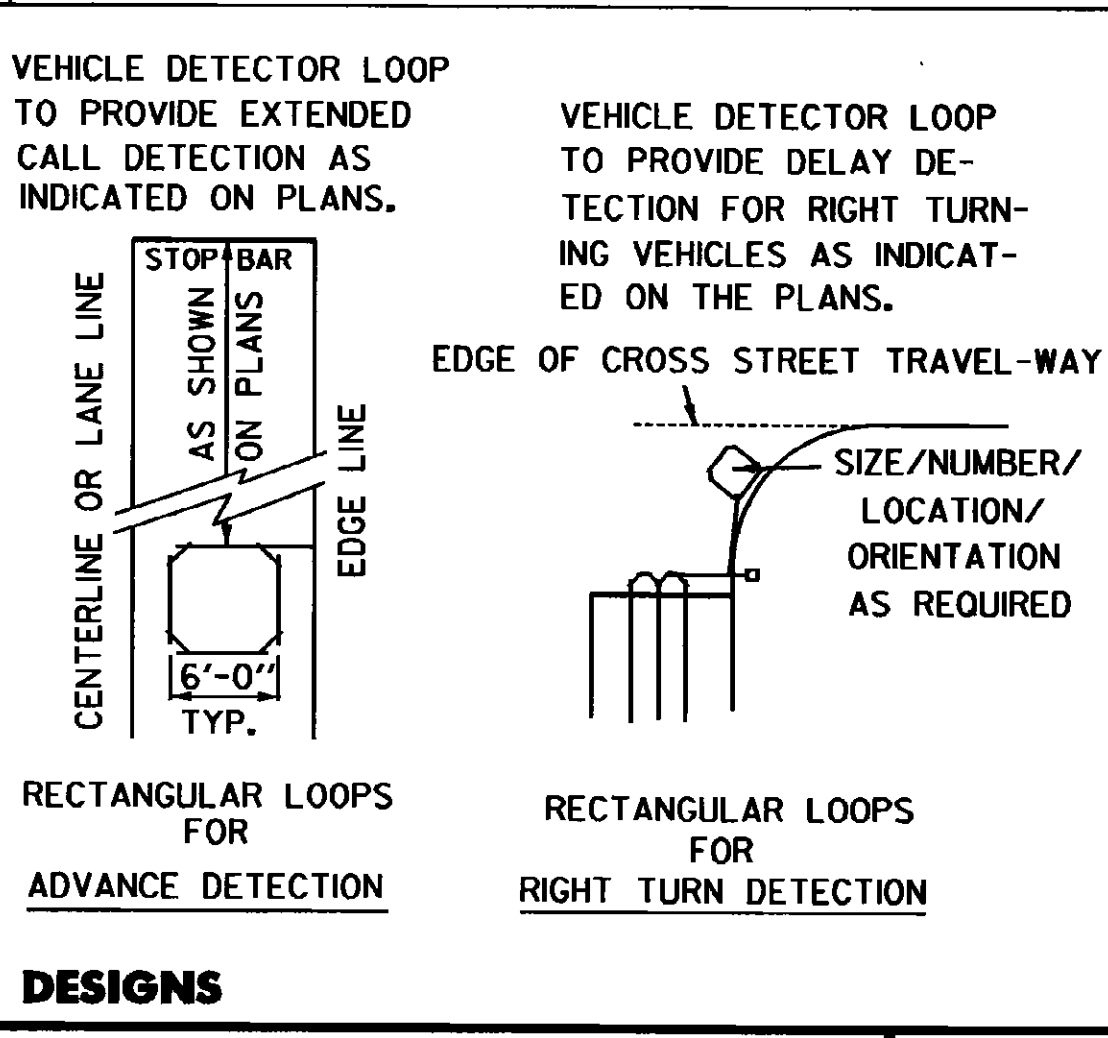
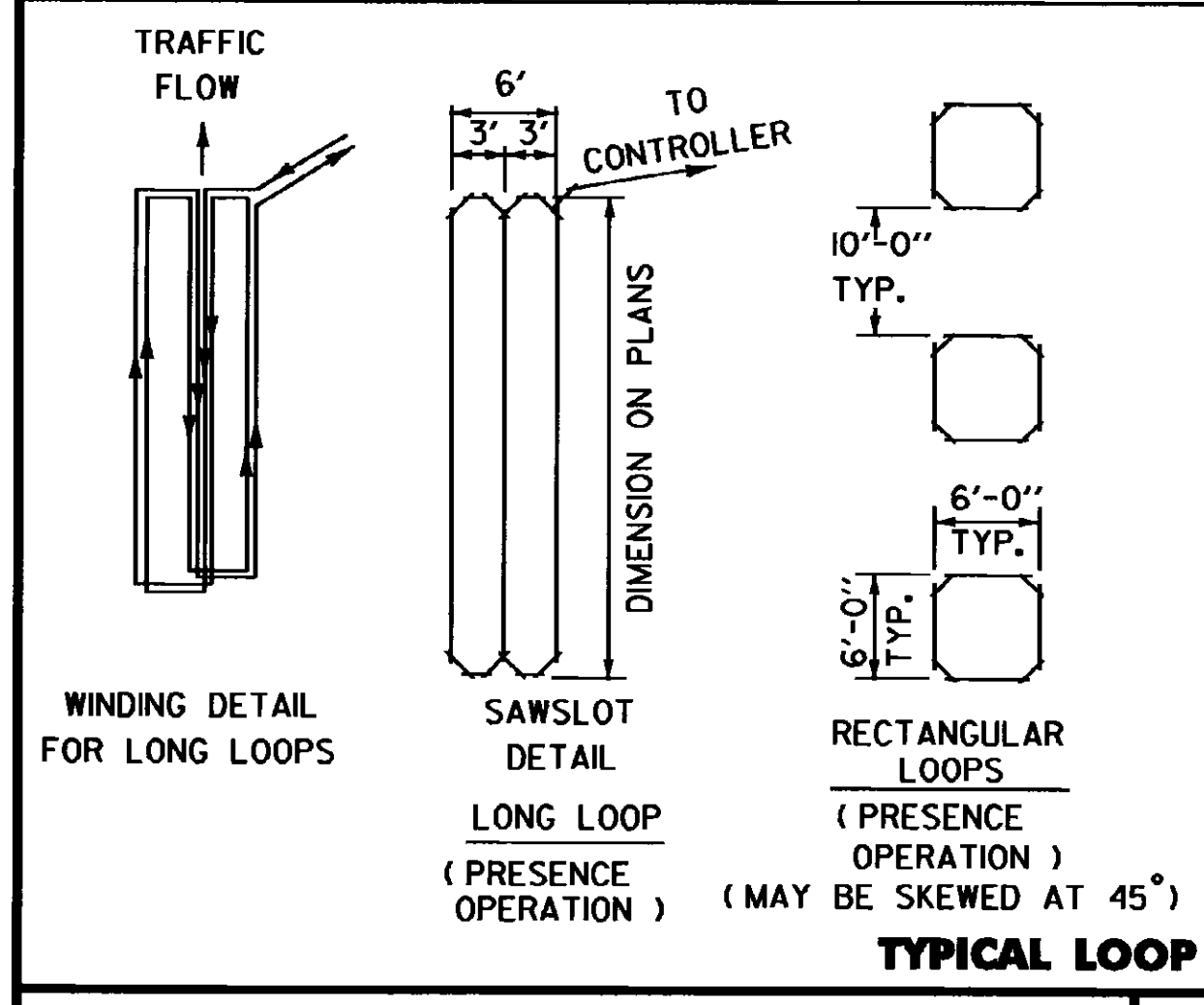
NOTE :

1. TO THE ABOVE LOOP INDUCTANCES, ADD 25 MICROHENRIES FOR EACH 100 FEET OF LEAD-IN CABLE FROM THE PAVEMENT LOOP TO THE CONTROLLER CABINET. LOOP LEAD-IN LENGTH SHALL NOT EXCEED 750 FEET.

2. THE FORMULA USED FOR THE TABLE ABOVE IS INDUCTANCE (L) = KPN²
WHERE K = $\frac{5}{10+N}$, N = NO. OF TURNS, P = LOOP PERIMETER.

3. WHEN LOOPS ARE CONNECTED IN SERIES (PREFERRED FOR SMALL LOOPS), THE TOTAL INDUCTANCE BECOMES THE SUM OF ALL INDUCTANCES. WHEN LOOPS ARE CONNECTED IN PARALLEL (PREFERRED FOR LONG LOOPS), THE COMBINED INDUCTANCE CAN BE CALCULATED FROM THE FOLLOWING EQUATION.

$$L_p = \left[\frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \dots} \right] + \text{LOOP LEAD-IN INDUCTANCES.}$$



45° ELBOW

FILL WITH LOOP EMBEDDING SEALANT

LOOP WIRES

6" 6" 1' MAX.

2- 1/4" MIN.

PAVEMENT

INSULATING BUSHING AND DUCTSEAL

2- 1/4" MIN. HOLE

30° TO 60° TYP.

1-1/2" MIN. FLEXIBLE LIQUIDTIGHT PVC CONDUIT

CURB

SIDEWALK

SHOULDER

24" MIN.

24" MIN.

TO PULLBOX

TWIST MIN. FIVE TURNS PER FOOT (SEE WIRE TWIST DETAIL)

CONDUIT DETAIL FOR LOOP LEAD-IN TO CONTROLLER / PULL BOX

- GENERAL NOTES**
- THE TERM "VEHICLE DETECTOR LOOP" SHALL REFER TO THE SENSOR EQUIPMENT EMBEDDED IN THE PAVEMENT WHICH SENSES VEHICLE PASSAGE OR PRESENCE. THE TERM "CABINET AMPLIFIER" SHALL REFER TO THE ELECTRICAL OR ELECTRONIC DEVICE LOCATED IN THE CONTROLLER CABINET WHICH RESPONDS DIRECTLY TO A VEHICLE ACTUATION AND INTERFACES WITH THE CONTROLLER.
 - WHEN THE DISTANCE FROM THE SAWCUT TO THE CONTROLLER EXCEEDS 25 FEET, SHIELDED CABLE SHALL BE USED TO EXTEND LOOP LEAD-INS FROM A JUNCTION BOX, PULLBOX OR POLE BASE TO THE CABINET. IT SHALL MEET THE REQUIREMENTS OF ISMA SPEC. NO. 50-2.
 - VEHICLE DETECTOR LOOP SHALL BE INSTALLED IN SUCH A WAY AS TO MAXIMIZE SENSITIVITY AND BE CAPABLE OF DETECTING MOTORCYCLES AND BICYCLES, WHILE ELIMINATING FALSE CALLS FROM VEHICLES IN ADJACENT LANES. LOOPS SHOULD BE DESIGNED SO THAT THE TOTAL INDUCTANCE (LOOPS) PLUS LEAD-INS) AT THE AMPLIFIER IS BETWEEN 100 AND 450 MICROHENRIES (200-300 PREFERRED). FOR SINGLE LOOPS, THE LOOP INDUCTANCE SHOULD BE AT LEAST TWICE THAT OF THE LEAD-IN. FOR MULTIPLE LOOPS, THE INDUCTANCE ON THE STREET SIDE OF THE SPLICE SHOULD BE AT LEAST TWICE THAT ON THE CONTROLLER SIDE.
 - THE LOOPS SHALL BE CENTERED IN THEIR RESPECTIVE LANES, UNLESS OTHERWISE NOTED.
 - ALL LOOPS SHALL OPERATE IN THE PRESENCE MODE WITH THE CONTROLLER SET TO LOCKING MEMORY FOR "LEFT-ONLY" OR "THRU-ONLY" LANES. ALL OTHER LANES SHALL UTILIZE NON-LOCKING MEMORY, UNLESS OTHERWISE NOTED.
 - ALL LOOPS IN "RIGHT TURN ONLY" LANES OR LOOP PLACED TO DETECT ONLY RIGHT TURNING VEHICLES SHALL HAVE DELAYED CALL LOOP AMPLIFIERS, UNLESS OTHERWISE NOTED.
 - ALL LOOP DETECTORS SHALL BE OF A TYPE THAT FAIL IN THE "ON" MODE.
 - ALL LOOP AND LEAD-IN WIRE SHALL BE #12 AWG. THE RESISTANCE OF #12 AWG IS 1.62 OHMS / 1000' AT 77° F.
- INSTALLATION NOTES**
- ALL SPLICES SHALL BE MADE IN PULLBOXES, JUNCTION BOXES, OR POLE BASES. ALL SPLICES SHALL BE SOLDERED, USING ROSIN CORE SOLDER, AND THEN BE FULLY SEALED BY THE APPLICATION OF DUAL-WALL, HEAT-SHRINKABLE TUBING, UNLESS OTHERWISE NOTED. A MINIMUM OF 3' OF SLACK SHALL BE LEFT IN EACH CABLE IN EACH BOX OR BASE.
- LOOP TESTING**
- DURING INSTALLATION OF THE LOOPS, THE CONTRACTOR SHALL MEASURE THE LOOP INDUCTANCE, LEAKAGE TO GROUND AND LOOP RESISTANCE IN THE PRESENCE OF THE RESIDENT ENGINEER. THE CONTRACTOR SHALL PROVIDE THE APPROPRIATE EQUIPMENT. THE INSTALLATION SHALL BE CONSIDERED ACCEPTABLE IF:
- THE INDUCTANCE READING IS WITHIN 10% ± OF THE CALCULATED VALUE.
 - THE INSULATION TEST (LEAKAGE TO GROUND) IS ABOVE 5 MEGOHMS FOR EXISTING LOOPS AND 100 MEGOHMS FOR NEW LOOPS USING A 500 VOLT DC INPUT.
 - THE LOOP RESISTANCE IS WITHIN 25% ± OF THE CALCULATED VALUE.
- IF THE READINGS FALL OUTSIDE THE ABOVE RANGES, CORRECTIVE MEASURES MAY BE REQUIRED AND THE ENGINEER SHALL NOTIFY THE TRAFFIC AND SAFETY DIVISION. THE COST OF TESTING THE LOOPS AND ANY NECESSARY CORRECTIONS SHALL BE SUBSIDIARY TO THE ITEM "VEHICLE DETECTOR LOOP". THE CALCULATED VALUES SHALL BE SHOWN ON THE PLANS. LOOP TESTING IS NOT REQUIRED FOR TEMPORARY LOOPS.
- OTHER STDS. REQUIRED**
- NONE

REVISIONS AND CORRECTIONS

SEPT. 10, 1987 - DATE OF ORIGINAL ISSUE

NOV. 17 1993 - MAJOR NOTE & TABLE REVISIONS

AUG. 9, 1995 - REVISED INSTALLATION NOTES 5 & 6. TYP. LOOP DESIGN & MINOR CHANGES

APPROVED FOR THIS PROJECT AND/OR DESIGN IMPLEMENTATION. FHWA FINAL APPROVAL PENDING.

APPROVED

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VEHICLE DETECTOR LOOP DETAILS

/traf/std/stdel72.dgn - stdel72.1

VERMONT AGENCY OF TRANSPORTATION

STANDARD E-172